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Dakshayani VP
M.Sc Agriculture, Department of agronomy, College of Agriculture (UASB), V. C Farm, Mandya, Karnataka, India

PS Fathima
Head and Professor, Department of agronomy, College of Agriculture (UASB), V. C Farm, Mandya, Karnataka, India

Brunda K
Seed Science and Technology Department of Genetics and Plant Breeding Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh, India

Ramachandra C
Professor, AICRP Rice, ZARS, V.C Farm, Mandya, Karnataka, India

Harshitha, BV
Department of Agronomy College of Agriculture V.C Farm, Mandya, Karnataka, India

Correspondence
Dakshayani VP
M.Sc Agriculture, Department of agronomy, College of Agriculture (UASB), V. C Farm, Mandya, Karnataka, India

Effect of post emergence herbicides on yield and yield attributes of transplanted rice in southern dry zone of Karnataka

Dakshayani VP, PS Fathima, Brunda K, Ramachandra C and Harshitha, BV

Abstract
The study conducted at College of Agriculture, V. C Farm, Mandya 2016 to know the effect of post emergence herbicides on yield and yield attributes of transplanted rice in southern dry zone of Karnataka. The results revealed that post emergence application of Chlorimuron-ethyl + metsulfuronmethyl 20 WP @ 4.00 g *a.i.* ha^{-1} at15 DAS recorded similar yields as that of farmer's practice i.e., hand weeding twice at 20 and 40 Days after transplanting (DAT) and it was followed with pre emergence application of bensulfuron methyl + pretilachlor 6.6 G @ 660 g *a.i.* ha^{-1} at 3 DAS.

Keywords: yield attributes, transplanted rice, Agriculture

Introduction

Rice (*Oryza sativa* L.), is the staple food of over half world's population and in Asia 1.3 billion population depend on it for their diet. Out of 472.39 million tonnes of Rice production in the world, 85 per cent is used for human consumption. Globally rice is cultivated in an area of 157.8 million hectare with a production of 491.3 million tonnes (2015-2016). India contributes 8.37 per cent to the area (13.211 m ha) and 18 per cent to the production (90.6 million tonnes). Among the total cereal produced in India during 2015-2016 (118.5 million tonnes) rice occupies the proportion of 76.45.

In Karnataka Rice is cultivated in 1.39 m ha area producing 3.45 million tonnes with productivity of 2470 kg ha^{-1} contributing about 3.18 per cent to all India rice area, 3.69 per cent to all India rice production and +15.91 per cent increase over all India rice productivity.

Southern Dry Zone of Karnataka (Zone-6) occupies total geographical area of 15.56 lakh hectares comprising of 18 taluks is distributed over Chamrajnagar, Hassan, Tumkur, Mandya and Mysore districts with annual rainfall of 671 - 889 mm. Here rice is grown under 3 lakh hectares with a production of 6.5 lakh tonnes and productivity of 2.2 tonnes per ha. In each district nearly 60-80 per cent of total area is covered during kharif (wet) season, while the remaining area is occupied in late *kharif* and summer (dry) season. Rice is grown in varying ecosystems but mainly as a wetland crop by transplanting seedlings into puddle fields. However weeds grow profusely in the rice fields and reduce crop yields drastically. Nowadays, weeds are considered as major biological constraints that reduces the potentiality of rice (Kumar and Ladha 2011; Rao and Nagamani, 2013) [3, 7]. The risk due to weeds is lower in transplanted rice since the age old plants are transplanted so that the competition from the weeds is lower (Chauan and Johnson, 2010) [1]. Due to weed competition during the crop production the decrease in the yield was estimated to about 16 - 86 per cent (Duary *et al*., 2004) [2].

Among different weed management methods, hand weeding is labourious, costlier and time consuming, biological methods are crop specific and use of pre- emergence application of herbicides results in weed shift and herbicides resistance therefore the investigation was carried to study the effect of post emergence herbicides on yield and yield attributes of transplanted rice evaluate post emergence herbicides on yield and yield attributes in transplanted rice with the.

Methodology

The field experiment was conducted at College of agriculture, V. C Farm, Mandya which falls under the region III of Southern Dry Zone of Karnataka (Zone-VI). Geographically located at 12 ^{0} 45′ and 30 ^{0} 57′ North latitude and 76 ^{0} 45′ and 78 ^{0} 24′ East longitude at an altitude of 695 meter above mean sea level in red sandy loam soil. The field experiment was laid out in a

Randomised Complete Block Design (RCBD) in three replications with following 10 treatments.

T_1 : Fenoxaprop-p-ethyl 9 EC @ 56.25 ml *a.i.* ha^{-1} at15 DAS
T_2 : Ethoxysulfuron 15 WG @ 18.50 g *a.i.* ha^{-1} at15 DAS
T_3 : Bispyribac-sodium 12 SC @ 20.0 ml *a.i.* ha^{-1} at15 DAS
T_4 : Penoxsulam 24 SC @ 22.5 ml *a.i.* ha^{-1} at15 DAS
T_5 : Chlorimuron-ethyl+metsulfuronmethyl 20 WP @ 4.00 g *a.i.* ha^{-1} at15 DAS
T_6 : 2, 4 D sodium salt 80 WP @ 2.0 kg *a.i.* ha^{-1} at15 DAS
T_7 : Oxadiargyl 80 WP @ 120 g *a.i.* ha^{-1} at 3 DAS
T_8 : Bensulfuron methyl+pretilachlor 6.6 G @ 660 g *a.i.* ha^{-1} at 3 DAS
T_9 : Hand weeding at 20 DAS
T_{10} : Control (unweedy check).

Puddled field of individual plot size of 5 m x 3.5 m, with bund of 0.5 m^2. Rice variety MTU 1001, (23 age old) seedlings were transplanted to fertilized plot (100, 50 and 50 kg of N, P_2O_5 and K_2O, respectively). The observations on yield and yield attributes were recorded at the day of harvest and the data collected from the experiment were subjected to statistical analysis. The level of significance used in 'F' and 'T' test was 0.05.

Results and discussion

Among the yield attributes number of panicles m^{-2} panicle weight and number of filled grains per panicle varied significantly among the weed management treatments (Table I). Significantly higher values were recorded with hand weeding twice at 20 and 40 DAT (377.8 m^{-2}, 4.7 g and 594 respectively) and it was at par with rest of the treatments except T_{10} which may be due to lower crop weed competition better nutrient availability for the uptake higher photosynthate production and partitioning towards sink (grains). Significantly lower number of panicles m^{-2} panicle weight and number of filled grains per panicle (238.9, 3.4 g 460.7) was recorded with control. These are in conformity with the findings of Mishra *et al.* (2007) [4]; Raj *et al.* (2016) [9, 6] and Sansa *et al.* (2016) [9].

Significantly lower % chaffyness (3.2) was recorded with hand weeding twice at 20 and 40 DAT over all other treatments except post emergence application of chlorimuron-ethyl + metsulfuron methyl 20 WP @ 4.0 g a.i. ha^{-1} at15 DAT which was on par and higher % chaffyness (13.0) was recorded with control. This may be because of inadequate accumulation and partition of photosynthates to sink due to crop weed competition during all growth stages of transplanted rice. Simultaneously panicle length number of grains per panicle and 1000 grain weight didn't show significant variation among the treatments as these are genetic characters and not greatly affected by environment.

The hand weeding twice at 20 and 40 DAT recorded 45.25 and 26 % greater grain and straw yield over the control and followed by post emergence application of chlorimuron-ethyl + metsulfuron methyl 20 WP @ 4.0 g a.i. ha^{-1} at 15 DAT. Other treatments were at par with each other except T_2 (4757 and 8768 kg ha^{-1} respectively) and T_{10} (4300 and 8522 kg ha^{-1} respectively) which recorded least yields. This change in yields may be due to decreased weed competition and minimum nutrient uptake removal by weeds which might have increased the capacity of nutrient uptake and enhanced the source and sink sizes which in turn had increased the yield attributes which resulted in increased yield. Similar trend was recorded with harvest index where T_9 recorded higher HI (0.42) and T_{10} recorded lower HI (0.30). The findings of present study are in conformity with the results obtained by Saha and Rao (2010) [8]; Sunil *et al*. (2009) [10] and Parameswari and Srinivas (2014) [5].

Table I: Effect of post emergence herbicides on number of panicles m^{-2}, panicle length panicle weight, number of grains per panicle, chaffyness, 1000 grain weight, grain yield, straw yield and harvest index, of transplanted rice

Treatment	No. of Panicles m^{-2}	Panicle length (cm)	Panicle weight (g)	No. of grains per panicle	No. of filled grains per panicle	Chaffyness (%)	1000 grain weight (g)	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Harvest index
T_1	256.0	22.1	4.3	565.3	517.7	6.6	20.5	5453	9696	0.37
T_2	243.5	21.2	4.0	501.0	465.7	9.3	20.2	4757	8768	0.32
T_3	258.5	22.6	4.5	567.3	541.7	6.2	20.6	5703	10187	0.37
T_4	257.6	22.3	4.4	551.7	529.7	6.2	20.5	5534	10123	0.37
T_5	293.0	24.6	4.6	607.7	572.7	4.6	21.4	6241	10348	0.40
T_6	250.8	21.5	4.3	522.0	512.3	7.4	20.4	5316	9632	0.37
T_7	246.1	21.4	4.2	557.7	489.7	8.9	20.4	5286	8805	0.35
T_8	282.7	22.7	4.5	588.3	551.0	5.1	20.9	5839	10244	0.38
T_9	377.8	25.3	4.7	630.7	594.0	3.3	22.3	6247	10742	0.42
T_{10}	238.9	20.5	3.4	509.0	440.7	13.0	19.1	4300	8522	0.30
S.Em±	16.39	1.16	0.24	50.76	51.1	0.58	1.87	325.22	567.22	0.04
CD (P=0.05) CV %	48.70	NS	0.71	NS	151.7	1.72	NS	966.28	1685.29	0.11

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